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10/815,022	03/31/2004	Kutay F. Ustuner	2003P18618US	1005

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Siemens Corporation
Intellectual Property Department
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EXAMINER	
CHAO, ELMER M	

ART UNIT	PAPER NUMBER
3737	

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03/04/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/815,022	USTUNER ET AL.	
	Examiner	Art Unit	
	ELMER CHAO	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Acknowledgement is made of the amendment filed 1/8/2008.

Specification

2. The substitute specification filed 1/8/2008 has not been entered.

Response to Arguments

3. Applicant's arguments filed 1/8/2008 have been fully considered but they are not persuasive.

4. Regarding the Applicants' arguments with respect to the Robinson et al. reference, the Applicants argue that "As noted by the Examiner (page 3 of the Office Action dated October 15, 2007), Robinson, et al. do not disclose different lateral ranges for the 2D and 3D scans." Examiner agrees that Robinson et al. do not *explicitly* disclose different lateral ranges, however, Robinson et al. do clearly show that the 2D and 3D scans have different lateral regions (see at least fig. 11, item 402, the 2D scan plane clearly has a larger lateral range than at least the front portion of the 3D scan volume of figure 11). Since a 103(a) rejection was made based on Robinson et al. in view of Hossack et al., a 102 teaching based on Robinson et al. would also be encompassed by the rejection.

5. Regarding the Applicants' arguments with respect to the Robinson et al. and Hossack et al. references, Applicants argue that "Hossack, et al. also do not disclose different lateral ranges for 2D and 3D or even different scan types" (second to last paragraph of page 9, Remarks). However, in addition to the arguments made above,

Examiner asserts that Hossack et al. need not teach different scan types (ie. 3D and 2D). Instead, Robinson et al.'s invention already discloses the two different scan types (see at least col. 8, lines 6-28, refer to "two dimensional image" and "three dimensional image"). Applicants are informed that Hossack et al. is used in the rejection as a teaching reference regarding the limitation of utilizing different lateral ranges, and does not necessarily need to teach using different scan types.

6. Regarding the Applicants' arguments with respect to claim 18, Applicants argue that "Regional separation of resolution only allows distinction of fine and coarse details in the high resolution region. The low resolution region does not show fine detail." (first paragraph of page 11, Remarks). Examiner points out that one of ordinary skill in the art would understand that in view of Smith et al.'s teaching of targeting a sub-volume (fig. 1b), the use of a higher resolution during the sub-volume scan would be an obvious feature. Using a higher resolution in a targeted area is a decision that varies based on the specific procedure. To say that one of ordinary skill in the art would decide to scan the entire volume at the same high resolution would be unrealistic since Smith et al. already teach that the sub-volume is being targeted as the area of interest to be scanned. One of ordinary skill in the art would not decide to instead scan the entire 3D volume at a higher resolution.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. **Claims 1-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al (US6582367) in view of Hossack et al (US5873830).

As per **claims 1, 2, and 5**, Robinson et al discloses a method for acquiring ultrasound data for display, comprising scanning along a two-dimensional plane (502) over a first lateral and angular range with ultrasound and generating an image (Figures 11 and 12), and scanning a three-dimensional volume (400) over a second lateral and angular range with ultrasound and generating an image (Figure 11), wherein the two-dimensional and three dimensional scans are interleaved (see Figures 11 and 12). Robinson et al does not explicitly disclose that the second lateral and angular range is less than the first lateral and angular range. Hossack et al discloses different lateral and angular ranges between different regions of an interleaved (composite, column 2, line 41) ultrasound image (first and second sets of different imaging parameters, column 2, lines 45-65) different imaging parameters within and outside a region of interest in an ultrasound image). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use different lateral and angular ranges for different parts of an interleaved (composite) image in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract). Furthermore, It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a greater lateral and angular range for the two-dimensional scan than for the three-dimensional scan

because the latter is more time consuming and must therefore be limited in lateral and angular extent.

As per **claim 3**, Robinson et al further discloses scanning over approximately a 90 degree sector (Figures 11 and 12).

As per **claim 4**, Robinson et al further discloses scanning over a third lateral and angular range (504) perpendicular to the first two-dimensional plane (502). Robinson et al does not explicitly disclose that the third lateral and angular range is less than the first lateral and angular range. Hossack et al discloses different lateral and angular ranges between different regions of an interleaved (composite, column 2, line 41) ultrasound image (first and second sets of different imaging parameters, column 2, lines 45-65). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use different lateral and angular ranges for different parts of an interleaved (composite) image in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract).

As per **claim 6**, Robinson et al further discloses generating a two-dimensional B-mode image (B mode lines of the two dimensional image (402), column 8, line 56), and generating a three-dimensional Doppler representation (the three dimensional image ... acquire a view of a volume of tissue and vasculature within the body, column 8, lines 17-20; see also Figure 11).

As per **claim 7**, Robinson et al further discloses user input (inputs from the user, column 6, line 62) to control beamformer steering and focusing (column 6, lines 37-67), which inherently encompasses setting the second lateral range.

As per **claim 8**, and as applied to claim 1 above, Robinson et al discloses all the elements of the claimed invention except that it does not explicitly disclose scanning with first and second imaging parameters of the same type but having different values. Hossack et al discloses using different values for the first and second set of imaging parameters (said first set being different from a second set of imaging parameters, column 2, line 34-44; increasing an actual frame rate inside the region of interest by acquiring additional real ultrasound image frames inside the region of interest, columns 2, lines 66-67 and column 3, lines 1-2). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use different imaging parameters (e.g. frame rates) for different parts of an interleaved (composite) image in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract).

As per **claims 9 and 10**, and as applied to claim 8 above, Robinson et al discloses all the elements of the claimed invention except that it does not explicitly disclose using different first and second imaging parameters chosen from at least one of various parameters enumerated in the claim. Hossack et al discloses that the first and second imaging parameters can be selected from a list of parameters including scan line density (line density, column 2, line 46), bandwidth (receive frequency band, column 2, line 52), and center frequency (ultrasound operating frequency, column 2, lines 49-50), with different first and second imaging parameters (said first set being different from a second set of imaging parameters, column 2, line 34-44) in order to obtain higher spatial resolution (improving spatial characteristics within a region of interest within an

ultrasound image, column 2, lines 33-34). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use, for example, different frequency, bandwidth, and/or line density for the first and second imaging parameters in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract).

As per **claims 11-13**, Robinson et al discloses a system for acquiring ultrasound data for display, comprising a transducer (2D array, see abstract), and a beamformer (system beamformer, column 2, line 12), operable to scan along a two-dimensional plane (502) over a first lateral and angular range with ultrasound and displaying an image (scanning a planar region in two dimensions, see abstract; see also Figures 11 and 12), and to scan a three-dimensional volume (400) over a second lateral and angular range with ultrasound and displaying an image (scanning a volumetric region in three dimensions, see abstract), wherein the two-dimensional and three dimensional scans are interleaved (see Figures 11 and 12). Robinson et al does not explicitly disclose that the second lateral and angular range is less than the first lateral and angular range. Hossack et al discloses different lateral and angular ranges between different regions of an interleaved (composite, column 2, line 41) ultrasound image (selecting a region of interest of an ultrasound-image frame.., column 2, lines 30-65) and therefore inherently discloses that one of the two regions must occupy a greater angular range than the other. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use different lateral and angular ranges for different parts of an interleaved (composite)

image in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract). Furthermore, It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a greater lateral and angular range for the two-dimensional scan than for the three-dimensional scan because the latter is more time consuming and must therefore be limited in lateral and angular extent.

As per **claim 14**, and as applied to claim 13 above, Robinson et al further discloses that the two-dimensional and three-dimensional images may be obtained using B-mode and Doppler processing (The beamformed signals are B mode or Doppler processed by a signal processor (206), column 7, line 5-6) and that the modes used for the two images may be different (three-dimensional harmonic image ... and two dimensional Doppler flow image, column 6, lines 66-68 and column 7, line1), and that color Doppler mode may be used (Doppler ensembles for colorflow processing, column 8, line 57). Robinson et al does not explicitly disclose using a B-mode display for the two-dimensional image and using a color Doppler display for the three- dimensional image. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use a B-mode display for the two-dimensional image and to use a color Doppler display for the three- dimensional image because the color Doppler display is necessary to accurately visualize flow directions in three dimensions and the B-mode display is sufficient to distinguish gross anatomical features in the vicinity of the vasculature being imaged in three dimensions.

As per **claim 15**, and as applied to claim 11 above, Robinson et al further

discloses user input (inputs from the user, column 6, line 62) to control beamformer steering and focusing (column 6, lines 37-67), which inherently encompasses setting the second lateral range.

As per **claim 16**, and as applied to claim 11 above, Robinson et al discloses all the elements of the claimed invention except that it does not explicitly disclose that the beamformer is operable to scan an outer region of the two-dimensional plane with a higher resolution than the scan of the three-dimensional region. Hossack et al discloses that the first and second imaging parameters can be selected from a list of parameters including scan line density (line density, column 2, line 46), frequency band, column 2, line 52), and center frequency (ultrasound operating frequency, column 2, lines 49-50), with different first and second imaging parameters (said first set being different from a second set of imaging parameters, column 2, line 34-44) in order to obtain higher spatial resolution (improving spatial characteristics within a region of interest within an ultrasound image, column 2, lines 33-34). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson et al to use a higher resolution for an outer region of the two-dimensional plane than for the scan of the three-dimensional volume if the anatomical detail in the former were finer than in the latter.

As per **claim 17**, and as applied to claim 11 above, Robinson et al further discloses user input (inputs from the user, column 6, line 62) to control beamformer steering and focusing (column 6, lines 37-67), which inherently encompasses setting

the steering angle of the three-dimensional volume.

9. **Claims 18-29** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al (US6582367) in view of Hossack et al (US5873830), and further in view of Smith et al (US 6241675).

As per **claims 18-23** the Robinson et al/Hossack et al combination, as applied to claim 1 above, discloses all the elements of the claimed inventions except for scanning within three-dimensional sub-volume with a higher spatial resolution than in the three-dimensional volume. Smith et al discloses scanning within a three-dimensional sub-volume. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the Robinson et al/Hossack et al combination to scan within a three-dimensional sub-volume, as taught by Smith et al, in order to provide the operator with a clearer view of the underlying anatomy. Furthermore, using higher spatial resolution in the sub-volume than in the volume is an obvious modification in order to distinguish fine anatomical detail within the sub-volume and coarse anatomical detail within the volume.

As per **claim 24**, and as applied to claim 18 above, Robinson et al further discloses user input (inputs from the user, column 6, line 62) to control beamformer steering and focusing (column 6, lines 37-67), which inherently encompasses setting the sub-volume size.

As per **claim 25**, and as applied to claim 18 above, the Robinson et al/Smith et al combination discloses all the elements of the claimed invention except that it does not

explicitly disclose using different first and second imaging parameters chosen from at least one of various parameters enumerated in the claim. Hossack et al discloses that the first and second imaging parameters can be selected from a list of parameters including scan line density (line density, column 2, line 46), bandwidth (receive frequency band, column 2, line 52), and center frequency (ultrasound operating frequency, column 2, lines 49-50), with different first and second imaging parameters (said first set being different from a second set of imaging parameters, column 2, line 34-44) in order to obtain higher spatial resolution (improving spatial characteristics within a region of interest within an ultrasound image, column 2, lines 33-34). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the Robinson et al/Smith et al combination to use, for example, different frequency, bandwidth, and/or line density for the first and second imaging parameters in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract).

As per **claim 26**, and as applied to claim 18 above, the Robinson et al/Hossack et al/Smith et al combination discloses all the elements of the claimed invention except that it does not explicitly disclose the second spatial resolution being greater than 1/3 the first spatial resolution. Smith et al discloses a sub-volume region being roughly 1/20 of the volume region (Figure 1A). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the Robinson et al Hossack et al/Smith et al combination to use a sub-volume having spatial resolution at least 1/3 the spatial resolution of the volume, for example by using more scan lines in

the sub-volume, because doing so would allow more accurate viewing of anatomical details and would result in a negligible increase in the overall scan time.

As per **claim 27**, and as applied to claim 11 above, the Robinson et al/Hossack et al combination discloses all the elements of the claimed invention except for scanning within a three-dimensional sub-volume with a higher spatial resolution than in the three-dimensional volume. Smith et al discloses scanning within a three-dimensional sub-volume (B2, Figure 1A). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the Robinson et al/Hossack et al combination to scan within a three-dimensional sub-volume, as taught by Smith et al, in order to provide the operator with a clearer view of the underlying anatomy. Furthermore, using higher spatial resolution in the sub-volume than in the volume is an obvious modification in order to distinguish fine anatomical detail within the sub-volume and coarse anatomical detail within the volume.

As per **claim 28**, and as applied to claim 27 above, Robinson et al further discloses user input (inputs from the user, column 6, line 62) to control beamformer steering and focusing (column 6, lines 37-67), which inherently encompasses setting the sub-volume size.

As per **claim 29**, and as applied to claim 27 above, the Robinson et al/Smith et al combination discloses all the elements of the claimed invention except that it does not explicitly disclose using different first and second imaging parameters chosen from at least one of various parameters enumerated in the claim. Hossack et al discloses that the first and second imaging parameters can be selected from a list of parameters

including scan line density (line density, column 2, line 46), bandwidth (receive frequency band, column 2, line 52), and center frequency (ultrasound operating frequency, column 2, lines 49-50), with different first and second imaging parameters (said first set being different from a second set of imaging parameters, column 2, line 34-44) in order to obtain higher spatial resolution (improving spatial characteristics within a region of interest within an ultrasound image, column 2, lines 33-34). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the Robinson et al/Smith et al combination to use, for example, different frequency, bandwidth, and/or line density for the first and second imaging parameters in order to improve spatial and/or temporal resolution inside a region of interest, as taught by Hossack et al (see abstract).

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELMER CHAO whose telephone number is (571)272-0674. The examiner can normally be reached on 9am-4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on (571)272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BRIAN CASLER/
Supervisory Patent Examiner, Art Unit 3737

/E. C./
Examiner, Art Unit 3737
2/28/2009